



## Information about the subject

**Degree:** Bachelor of Science Degree in Medicine

**Faculty:** Faculty of Medicine and Health Sciences

**Code:** 341105 **Name:** Biochemistry and Molecular Biology

**Credits:** 9,00 **ECTS Year:** 1 **Semester:** 1/2

**Module:** Morphology, structure and function of the human body

**Subject Matter:** Biochemistry **Type:** Basic Formation

**Field of knowledge:** Health Science

**Department:** -

**Type of learning:** Classroom-based learning

**Languages in which it is taught:** Spanish

### Lecturer/-s:

341A	<u>Jesús Ángel Prieto Ruiz</u> ( <b>Responsible Lecturer</b> )	jesus.prieto@ucv.es
	<u>Jose Miguel Hernandez Andreu</u>	jmiguel.hernandez@ucv.es
	<u>Lucia Gómez Tatay</u>	lucia.gomez@ucv.es
341B	<u>Jesús Ángel Prieto Ruiz</u> ( <b>Responsible Lecturer</b> )	jesus.prieto@ucv.es
	<u>Jose Miguel Hernandez Andreu</u>	jmiguel.hernandez@ucv.es
	<u>Lucia Gómez Tatay</u>	lucia.gomez@ucv.es



## Module organization

### Morphology, structure and function of the human body

Subject Matter	ECTS	Subject	ECTS	Year/semester
Morphology and microscopic structure of the human body	6,00	Histology	6,00	2/1
Biology	6,00	Cell Biology	6,00	1/1
Anatomy	27,00	Anatomy II	9,00	2/1
		Anatomy III	6,00	2/2
		Embryology and Anatomy I	12,00	1/2
Biochemistry	9,00	Biochemistry and Molecular Biology	9,00	1/2
Physics	6,00	Biophysics	6,00	1/2
Physiology	12,00	Human Physiology I	6,00	2/1
		Human Physiology II	6,00	2/2



## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 Know the types and functions of biomolecules.
- R2 Identify metabolic pathways and know how to integrate them.
- R3 Know the transmission of genetic information.
- R4 Know how to use different working techniques in the laboratory.
- R5 Interpret obtained results during practices
- R6 Be able to produce documents on biochemistry and work as a team.
- R7 Search for information in bibliographic sources, and know how to analyze them.



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students have demonstrated to possess and understand knowledge in a study area that starts from the base of the general secondary education, and is usually found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study				X
CB2	Students know how to apply their knowledge to their job or vocation in a professional way and possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study				X
CB3	Students have the ability to collect and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical topics				X
CB4	Students can pass on information, ideas, problems and solutions to both a specialized and non-specialized audience				X
CB5	Students have developed the learning skills needed to undertake further studies with a high degree of autonomy				X
GENERAL		Weighting			
		1	2	3	4
CG7	Understanding and recognizing the normal structure and function of the human body, at the molecular, cellular, tissue, organic and systems levels, at the different stages of life and in both sexes				X
CG11	Understanding and recognizing the effects of growth, development and aging on the individual and their social environment		X		



SPECIFIC		Weighting			
		1	2	3	4
CE1	Knowing the structure and cellular function. Biomolecules. Metabolism. Metabolic regulation and integration				X
CE4	Handling basic laboratory materials and techniques. Interpreting a normal analysis			X	
CE6	Performing functional tests, determine vital parameters, and interpret them. Basic physical examination	X			

TRANSVERSAL		Weighting			
		1	2	3	4
CT1	Analytical and synthesis capacity		X		
CT2	Planification and organization capacity	X			
CT3	Oral and written communication in mother language	X			
CT6	Manage information capacity	X			
CT7	Solving problems		X		
CT9	Team work		X		
CT14	Critical reasoning		X		
CT16	Individual learning		X		
CT25	Autocriticism capacity	X			



## Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5, R6, R7	60,00%	Tests
R4, R5	35,00%	Practices
R6, R7	5,00%	Participation in class

### Observations

- At the end of the first semester there will be a partial exam that will be eliminatory for students who obtain a minimum grade of 5/10. Completion of the first partial implies the renunciation of taking the entire subject at the end, except in the case that the grade is less than 5. There will be no compensation in the grade of those who, having passed the first partial, present themselves to the second and do not approve. The mark of the first partial **will not be saved** for the second call.
- Attendance at practices is compulsory. At the end of the practices, the completion of a Practice Report will be requested. Failure to attend a practice prevents the presentation of the corresponding report. The notes of the practices will only be saved from one year to the next, so that any student of the SP group who has the subject two or more years pending, must do the practices.
- Deliveries of work will not be accepted on the platform outside of the periods established for each activity. Sending jobs by email is not allowed.

### MENTION OF DISTINCTION:

According to Article 22 of the Regulations governing the Evaluation and Qualification of UCV Courses, the mention of "Distinction of Honor" may be awarded by the professor responsible for the course to students who have obtained, at least, the qualification of 9 over 10 ("Sobresaliente"). The number of "Distinction of Honor" mentions that may be awarded may not exceed five percent of the number of students included in the same official record, unless this number is lower than 20, in which case only one "Distinction of Honor" may be awarded.



## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

- M1 Masterclass
- M2 Problems resolution and practical cases
- M4 Content presentations by teacher
- M5 Knowledges and skills explanation
- M6 Laboratory practices
- M9 Knowledge acquirance through student interaction and activity
- M14 Online activity on e-learning
- M15 Personal study
- M16 Information research



## IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theory class M1, M2, M4, M5	R1, R2, R3, R6, R7	54,00	2,16
Seminar and group practices M4, M6, M9	R4, R5	13,50	0,54
Practices in small groups M2	R1, R2, R3	6,80	0,27
Tutoring M5, M9	R1, R2, R3, R7	2,30	0,09
Evaluation M2, M9, M15	R1, R2, R3, R4, R5, R6, R7	2,30	0,09
<b>TOTAL</b>		<b>78,90</b>	<b>3,16</b>

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
No attendance M2, M14, M15, M16	R1, R2, R3, R5, R6, R7	146,10	5,84
<b>TOTAL</b>		<b>146,10</b>	<b>5,84</b>



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
BLOCK I: STRUCTURAL BIOCHEMISTRY	<p>Unit 1. Introduction to the chemistry of life. Cellular fundamentals. Chemical fundamentals. Genetic Foundations. Evolutionary foundations.</p> <p>Unit 2. Water. Structure. Water as a solvent. The hydrophobic effect. Ionization of water. Weak acids and bases. Water as a reagent. Buffer solutions.</p> <p>Unit 3. Amino acids, peptides and proteins. Protein characterization. The covalent structure of proteins. Sequences protein and evolution.</p> <p>Unit 4. The three-dimensional structure of proteins. Primary, secondary, tertiary and quaternary structure. Denaturation and protein folding.</p> <p>Unit 5. Functions of proteins. Oxygen-binding proteins. Protein-Ligand Interactions: System immune. Interactions between proteins modulated by chemical energy: actin, myosin and molecular motors.</p> <p>Unit 6. Collagen. Structure. Composition of Tropocollagen. Synthesis of Collagen. Link types in the Mature collagen.</p> <p>Unit 7. Enzymes. Introduction to enzymes. Kinetic enzyme. Mechanisms. Regulatory enzymes.</p> <p>Unit 8. Carbohydrates and glycobiology. Monosaccharides and disaccharides. Polysaccharides. Glucoconjugates: proteoglycans, glycoproteins and glycolipids.</p> <p>Unit 9. Nucleotides and nucleic acids. Structure and functions.</p> <p>Unit 10. Lipids. Storage lipids. Lipids in membranes. Lipids as pigments, cofactors and signals.</p> <p>Unit 11. Biological membranes and transport. Composition and architecture of the membranes. Dynamics of the membranes. Solute transport through membranes. Biosignalization. Molecular mechanisms of signal transduction.</p>



## BLOCK II: Metabolism

Unit 12. Principles of bioenergetics. Bioenergetics and thermodynamics. Importance of ATP. Redox reactions.

Unit 13 Glycolysis, gluconeogenesis and the pentose phosphate pathway. Glycolysis. Routes of entry to glycolysis. Fermentation. Gluconeogenesis. The pentose phosphate pathway.

Unit 14 Principles of metabolic regulation: glucose and glycogen. Glycogen metabolism in animals. Regulation of metabolic pathways. Coordinated regulation of glycolysis and gluconeogenesis. Coordinated regulation of glycogen synthesis and degradation.

Unit 15 The citric acid cycle. Acetyl-CoA production. Reactions and regulation of the citric acid cycle. Cycle of glyoxylate.

Unit 16 Catabolism of fatty acids. Digestion, mobilization and transport of fats. Fatty acid oxidation. Ketone bodies.

Unit 17 Amino acid oxidation and urea production. Metabolic destinations of amino groups. Excretion of nitrogen and urea cycle. Pathways of degradation of amino acids.

Unit 18 Oxidative phosphorylation. Electron transfer reactions in the mitochondria. ATP synthesis. Regulation of oxidative phosphorylation. Mitochondrial genes: origin and effects of mutations. The role of the mitochondria in apoptosis and oxidative stress.

Unit 19 Lipid biosynthesis. Biosynthesis of fatty acids and eicosanoids. Triglyceride biosynthesis. Biosynthesis of membrane phospholipids. Cholesterol, steroid, and isoprenoid biosynthesis.

Unit 20 Biosynthesis of amino acids and nucleotides. Nitrogen metabolism. Amino Acid Biosynthesis. Derived molecules of amino acids. Nucleotide biosynthesis and degradation.

Unit 21 Hormonal regulation and integration of metabolism. Structure and function of hormones. Tissues with metabolism specific. Hormonal regulation of metabolism. Obesity and regulation of body mass.



BLOCK III: Genetic Information. Molecular Biology Techniques.

Unit 22 Flow of genetic information. Replication. Repair. Transcription. Maturation. The genetic code. Protein biosynthesis. Protein transport and degradation. Principles of regulation of gene expression. RNA interference.  
Unit 23 Recombinant DNA technology. Cloned. From genes to genomes. From genomes to proteomes. Alteration of genomes and biotechnology. Genetic engineering.

Temporary organization of learning:

Block of content	Number of sessions	Hours
BLOCK I: STRUCTURAL BIOCHEMISTRY	13,00	26,00
BLOCK II: Metabolism	18,00	36,00
BLOCK III: Genetic Information. Molecular Biology Techniques.	8,45	16,90

## References

- **LEHNINGER. PRINCIPIOS DE BIOQUÍMICA.** Cox, M.M. - Nelson, D.L. Editorial Omega, 2014 Sexta edición.
- **BIOLOGÍA MOLECULAR DE LA CÉLULA.** Alberts, B., et al. Editorial Omega, 2016. Sexta Edición.
- **BIOQUÍMICA.** Curso Básico. Tymoczko, John L.; Berg, Jeremy M.; Stryer, Lubert L. Editorial Reverté. 2014
- **BIOQUÍMICA.** Matthews, C.K., et al. Editorial PEARSON, 2013. Cuarta Edición
- **BIOQUÍMICA.** Tymoczko, John L.; Berg, Jeremy M.; Stryer, Lubert L. Editorial Reverté. 2013. Séptima Edición.
- **BIOQUÍMICA MÉDICA.** Baynes JW, Dominiczak. Elsevier 2011. Tercera Edición.
- **NETTER, BIOQUÍMICA ESENCIAL.** Peter Ronner. Elsevier 2020.
- **HARPER. BIOQUÍMICA ILUSTRADA.** Murray et al. Ed. Mc Graw Hill. 28ª edición. 2010



## Addendum to the Course Guide of the Subject

Due to the exceptional situation caused by the health crisis of the COVID-19 and taking into account the security measures related to the development of the educational activity in the Higher Education Institution teaching area, the following changes have been made in the guide of the subject to ensure that Students achieve their learning outcomes of the Subject.

**Situation 1: Teaching without limited capacity** (when the number of enrolled students is lower than the allowed capacity in classroom, according to the security measures taken).

In this case, no changes are made in the guide of the subject.

**Situation 2: Teaching with limited capacity** (when the number of enrolled students is higher than the allowed capacity in classroom, according to the security measures taken).

In this case, the following changes are made:

### 1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject will be made through a simultaneous teaching method combining onsite teaching in the classroom and synchronous online teaching. Students will be able to attend classes onsite or to attend them online through the telematic tools provided by the university (videoconferences). In any case, students who attend classes onsite and who attend them by videoconference will rotate periodically.

In the particular case of this subject, these videoconferences will be made through:

Microsoft Teams

Kaltura



## **Situation 3: Confinement due to a new State of Alarm.**

In this case, the following changes are made:

### **1. Educational Activities of Onsite Work:**

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject, as well as the group and personalized tutoring, will be done with the telematic tools provided by the University, through:

Microsoft Teams

Kaltura

Explanation about the practical sessions:



## 2. System for Assessing the Acquisition of the competences and Assessment System

### ONSITE WORK

#### Regarding the Assessment Tools:

The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

#### Comments to the Assessment System: